*Adding machines and calculators offer
many new features. It pays to know—*

Today's Figuring Machines

By PETER R. WEILL, Associate Editor

ONLY typewriters are seen more often in offices than figuring machines. In fact, for every 100 typewriters, 88 adding machines and calculators are sold. More and more of them are being made every year. They are the one type of machine that not even the smallest business can do without, including the corner grocer. He often has an adding machine augmenting the calculating capacity of his cash register, which itself was once described as "a cash drawer with an adding machine on top."

They are in use in every department of every division of the large firm. In the engineering division we find that many of the engineers have calculators at their work stations. They use them constantly to solve a variety of complicated problems.

Within the production division we find adding machines and calculators everywhere. The bookkeeping department uses them to enter and total figures used for cost accounting purposes. In purchasing and payroll they are busy constantly.

Practically everyone in the marketing division, from top executives on down, uses an adding machine or calculator at some time or another. The controller's office and the bookkeeping department are particularly heavy users. The statistics department, market research, advertising, and product control all find their figuring machines

indispensable, and use them constantly while generating data.

The figuring machines used in the office today can be divided into these classifications:
1. Adding and calculating.
2. Listing and nonlisting.
3. Full keyboard and ten-key.
4. Key driven, rotary driven, or electronic.
5. Hand operated and electric.

Adding machines are limited to addition and subtraction, in most cases. They can be used

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It might seem to the casual observer of the business scene that adding machines and calculators have outlived their usefulness, and are now being replaced by computers. Nothing could be farther from the truth. Today's data processing systems almost always begin with figuring machines, which "predigest" data for the electronic data processors into which the figures are fed.

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for multiplication and division, but their speed and capacity in this work is not as great as other types of machines. Many do not realize that an adding machine can do almost anything a calculator can. Multiplication is actually a function of addition, and can be performed that way on an adding machine. Most adding machines now come with a repeat feature that enables the skilled operator to easily per-

form the repeat addition needed to solve multiplication problems. Division is a little harder and more time consuming, but it can be accomplished in a similar fashion, utilizing repeat subtraction.

If an office or department has only occasional multiplication and division to perform, an adding machine would serve the purpose. However, if the bulk of office calculations involve multiplication or division, the capacity of an adding machine is inadequate, and a calculator—a machine which must be able to perform all four arithmetical functions—is indicated.

Since multiplication and division can be done on an adding machine, we must distinguish further. The calculator is made to do the multiplication, and particularly the division problems, much more quickly than the standard adding machine.
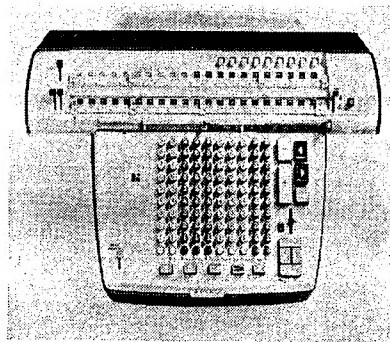
LISTING

A LISTING MACHINE prints the factors, or the numbers, of the problem on a roll of tape or sheet of paper. A nonlisting machine records the numbers only in a register so that the answers must be copied.
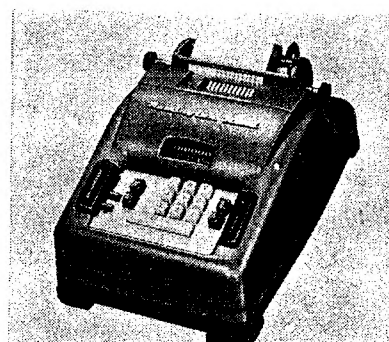
Almost all of today's adding machines are listing machines. When one thinks of adding machines, the familiar ten-key model with the roll of paper tape mounted in the rear comes to mind.

Among the features of today's adding machines and calculators are correction keys for erasing numbers, non-add keys for listing reference numbers without entering them into the machine, extra high-speed multiplication, storage facilities that enable the user to recall and enter the same number over again, keyboards designed for maximum operator efficiency, and electronic units that operate silently as fast as the speed of light.

Simple, non-listing adders are still available, however, and are perfectly adequate and frequently preferred if intended purely as a medium for personal calculation. They are relatively inexpensive, invariably simple to operate, and, providing the total figures are clear, enable the user to see at a glance the information he seeks.

Designed specifically for those wishing to make rapid calculations away from normal clerical activity—on building sites, during survey work, or in the course of traveling—there are simple stylus-operated pocket machines. Practically all non-listing adders are more or less portable, and often come with carrying cases.

To print or not to print—for years this was the question calculator designers asked themselves. The question has been decided in favor of the printing calculator. Today, 75 percent of all calculators sold are ten-key printing models, and the tide is still rising in favor of the printing machine.

The printing calculator possesses two distinct advantages over the non-printing unit. First, all the factors of the problem are preserved for reference. The tape provides a record, not only of the result, but of the elements that went into the problem. The machine creates a record as it calculates. This record, in the form of a printed tape, can travel from department to de-

Some New Figuring Machines

Monroe Monro-Matic Model 8F-213, an automatic rotary unit, has color-coded control keys.

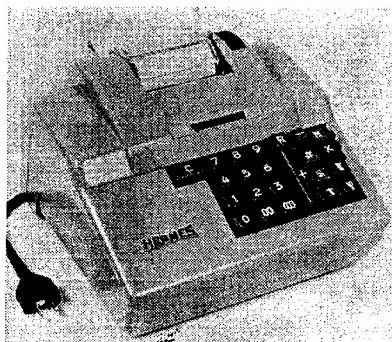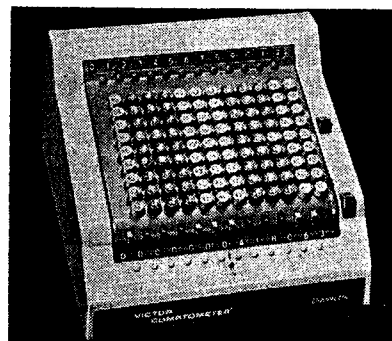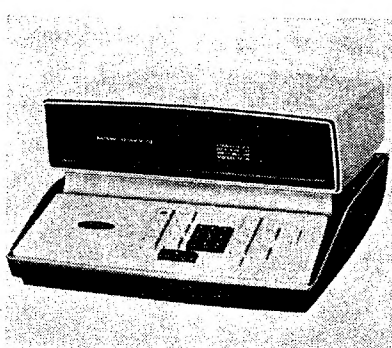**Clary** full keyboard adding machine has uncrowded keyboard, a plus bar on right and bottom.

Remington Model 193 adding machine features a correction key as well as a non-add feature.
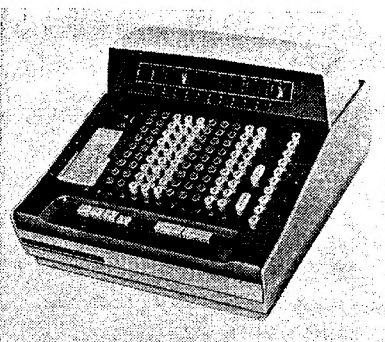

Friden 130 electronic calculator is one of few such devices available to offices at present time.

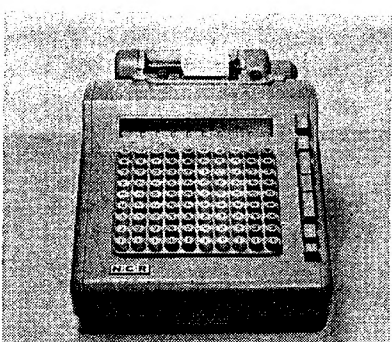**Hermes** 165 multiplier multiplies, but does not divide. Features "short cut" multiplication.

Anita electronic calculator was one of the first electronics to be sold. It has a full keyboard.

Victor Duoelectric 120 Comptometer is a key-driven calculator featuring storage facilities.

NCR full keyboard adding machine has a carriage that accepts various cards and papers.

MANUFACTURER OR DISTRIBUTOR	MODEL NAME	PRICE	TYPE	FULL OR ABRIDGED KEYBOARD	CAPACITY	FULLY OR SEMI-AUTOMATIC	STORAGE FACILITIES	BACK TRANSFER FEATURE	DECIMAL POINT IDENTI- FICATION	INQUIRY CARD No. TO CIRCLE FOR MORE DATA
ADDO-X, INC.	Model 4341	$525	Printing	Ten-Key	11	Fully automatic	Yes	No	Yes	45
ADDO-X, INC.	Model 4541	$675	Printing	Ten-Key	11	Fully automatic	Yes	No	Yes	45
BOHN BUSINESS MACHINES, INC.	Contex 10	$125	Rotary	Ten-Key	11	Fully automatic	No	No	Yes	46
BOHN BUSINESS MACHINES, INC.	Contex 20	$235	Rotary	Ten-Key	11	Fully automatic	No	No	Yes	46
CHECK WRITER CO., INC.	Totalia 8381	$595	Printing	Ten-Key	13	Fully automatic	Yes	Yes	Yes	47
CHECK WRITER CO., INC.	Numeria 5903	$198	Rotary	Full Keyboard	21	Semi-automatic	No	No	No	47
CHECK WRITER CO., INC.	Numeria 8923	$335	Rotary	Full Keyboard	21	Semi-automatic	No	No	No	47
FACIT-ODHNER, INC.	CI-13	$165	Rotary	Ten-Key	13	Semi-automatic	No	No	Yes	48
FACIT-ODHNER, INC.	CM 2-16	$195	Rotary	Ten-Key	16	Semi-automatic	No	No	Yes	48
FACIT-ODHNER, INC.	CS 1-13	$395	Rotary	Ten-Key	13	Semi-automatic	No	No	Yes	48
FACIT-ODHNER, INC.	CA 1-13	$525	Rotary	Ten-Key	13	Fully automatic	No	No	Yes	48
FACIT-ODHNER, INC.	CA 2-16	$785	Rotary	Ten-Key	16	Fully automatic	Yes	Yes	Yes	48
FACIT-ODHNER, INC.	00227	$99	Rotary	Ten-Key	13	Semi-automatic	No	Yes	Yes	48
FACIT-ODHNER, INC.	00229	$135	Rotary	Ten-Key	13	Semi-automatic	No	Yes	Yes	48
FRIDEN, INC.	130 EC	$1,990	Electronic	Ten-Key	13	Fully automatic	Yes	Yes	Yes	49
FRIDEN, INC.	SRQ	$1,395	Rotary	Full/Ten-Key	21	Fully automatic	No	No	Yes	49
FRIDEN, INC.	SVJ	$1,095	Rotary	Full/Ten-Key	21	Fully automatic	No	Yes	Yes	49
FRIDEN, INC.	STQ	$975	Rotary	Full/Ten-Key	21	Fully automatic	No	No	Yes	49
FRIDEN, INC.	SBT	$950	Rotary	Full/Ten-Key	20	Fully automatic	Yes	Yes	Yes	49
FRIDEN, INC.	STW-10	$880	Rotary	Full/Ten-Key	20	Fully automatic	No	No	Yes	49
FRIDEN, INC.	STW-8	$820	Rotary	Full/Ten-Key	17	Fully automatic	No	No	Yes	49
FRIDEN, INC.	SW-10	$755	Rotary	Full/Ten-Key	20	Fully automatic	No	No	Yes	49
FRIDEN, INC.	SW-8	$695	Rotary	Full/Ten-Key	17	Fully automatic	No	No	Yes	49
FRIDEN, INC.	CW-10	$595	Rotary	Full Keyboard	20	Semi-automatic	No	No	Yes	49
FRIDEN, INC.	CW-8	$525	Rotary	Full Keyboard	17	Semi-automatic	No	No	Yes	49
FRIDEN, INC.	DW-8	$475	Rotary	Full Keyboard	17	Semi-automatic	No	No	Yes	49
FRIDEN, INC.	HW-10	$350	Rotary	Full Keyboard	20	Semi-automatic	No	No	Yes	49
FRIDEN, INC.	HW-8	$300	Rotary	Full Keyboard	17	Semi-automatic	No	No	Yes	49
INTER-CONTINENTAL TRADING	Anita	$1,200	Electronic	Full Keyboard	10	Fully automatic	No	No	Yes	50
INTER-CONTINENTAL TRADING	Olympia RA-16	$755	Rotary	Ten-Key	8	Fully automatic	Yes	Yes	Yes	50
INTER-CONTINENTAL TRADING	Olympia RA-20	$855	Rotary	Ten-Key	10	Fully automatic	Yes	Yes	Yes	50
MARCHANT DIVISION OF SCM CORP.	Model 416	$1,075	Rotary/Ptg.	Ten-Key	16	Fully automatic	Yes	Yes	Yes	51
MARCHANT DIVISION OF SCM CORP.	Decimagic	$985	Rotary	Full Keyboard	20	Fully automatic	Yes	No	Yes	51
MARCHANT DIVISION OF SCM CORP.	Transflo	$945	Rotary	Full Keyboard	20	Fully automatic	Yes	Yes	Yes	51
MARCHANT DIVISION OF SCM CORP.	VSR	$995	Rotary	Full Keyboard	18	Fully automatic	Yes	Yes	Yes	51
MARCHANT DIVISION OF SCM CORP.	VR	$880	Rotary	Full Keyboard	18	Fully automatic	Yes	Yes	Yes	51
MARCHANT DIVISION OF SCM CORP.	10 CMF	$880	Rotary	Full Keyboard	20	Fully automatic	Yes	No	Yes	51
MARCHANT DIVISION OF SCM CORP.	8 CMF	$820	Rotary	Full Keyboard	16	Fully automatic	Yes	No	Yes	51
MARCHANT DIVISION OF SCM CORP.	10 CMF-X	$915	Rotary	Full Keyboard	20	Fully automatic	Yes	No	Yes	51
MARCHANT DIVISION OF SCM CORP.	10 CM	$775	Rotary	Full Keyboard	20	Fully automatic	Yes	No	Yes	51
MARCHANT DIVISION OF SCM CORP.	8 CM	$695	Rotary	Full Keyboard	16	Fully automatic	Yes	No	Yes	51
MARCHANT DIVISION OF SCM CORP.	10 CM-X	$790	Rotary	Full Keyboard	20	Fully automatic	Yes	No	Yes	51

Figuring CONTINUED

partment, and can become part of a permanent file.

The user of a printing calculator has another advantage over the user of a non-printing calculator. He can check errors much more easily. If an error is suspected, the user merely checks each factor recorded on the tape, and each of the printed symbols next to the factors which indicate the various arithmetical operations that were performed.

KEYBOARDS

THE FULL KEYBOARD, or full-bank keyboard machine, has from six to fourteen columns of numbers from one to nine. The zero is printed automatically in any column in which no number key is depressed. On the ten-key machine, there is only one key for each digit, zero through nine, or a total of ten keys plus control keys. The digits of a number must be recorded in the proper order, including the zeros.

The relative speed of these two types of machines with equally skilled operators, says the Dartnell Corporation, is so similar that it is usually just a matter of personal preference.

Proponents of the ten-key, or abbreviated, keyboard, however, told *AM* that the ten-key keyboard is actually faster. The reason for the extra speed, they say, is because a touch system, similar to touch typing, is used to index numbers into the machine. This is in contrast to the full-keyboard machine, where the method of entering numbers is more akin to the old "hunt and peck" system.

Proponents of the ten-key keyboard claim that because indexing numbers on a ten-key machine is by touch rather than by sight, operators achieve a substantially greater degree of accuracy than is possible on a full-bank keyboard. It is also claimed, however, that the full keyboard is more accurate. The columns of the full bank keyboard correspond to the columns of digits in the number the operator is entering. Because of the column-by-column sequence in which each number is visibly accounted for, proponents of the full keyboard say, there is much less possibility of confusion when using the full keyboard,

MANUFACTURER OR DISTRIBUTOR	MODEL NAME	PRICE	TYPE	FULL OR ABRIDGED KEYBOARD	CAPACITY	FULLY OR SEMI-AUTOMATIC	STORAGE FACILITIES	BACK TRANSFER FEATURE	DECIMAL POINT IDENTIFICATION	INQUIRY CARD NO. TO CIRCLE FOR MORE DATA
MARCHANT DIVISION OF SCM CORP.	10 CDF	$595	Rotary	Full Keyboard	20	Semi-automatic	No	No	Yes	51
MARCHANT DIVISION OF SCM CORP.	8 CDF	$525	Rotary	Full Keyboard	16	Semi-automatic	No	No	Yes	51
MARCHANT DIVISION OF SCM CORP.	8 CD	$475	Rotary	Full Keyboard	16	Semi-automatic	No	No	Yes	51
MARCHANT DIVISION OF SCM CORP.	Tenkeymatic 500	$395	Rotary	Ten-Key	16	Fully automatic	Yes	Yes	Yes	51
MARCHANT DIVISION OF SCM CORP.	Tenkeymaster 505	$595	Rotary	Ten-Key	16	Fully automatic	Yes	Yes	Yes	51
MONROE INTERNATIONAL, INC.	IQ-213	$1,085	Rotary	Full Keyboard	21	Fully automatic	Yes	Yes	Yes	52
MONROE INTERNATIONAL, INC.	8F-213	$915	Rotary	Full Keyboard	21	Fully automatic	Yes	Yes	Yes	52
MONROE INTERNATIONAL, INC.	3F3-162	$475	Rotary	Full Keyboard	16	Semi-automatic	No	No	Yes	52
MONROE INTERNATIONAL, INC.	6F-212	$815	Rotary	Full Keyboard	21	Fully automatic	Yes	No	Yes	52
MONROE INTERNATIONAL, INC.	LA 7-200	$445	Rotary	Full Keyboard	21	Semi-automatic	No	No	Yes	52
MONROE INTERNATIONAL, INC.	Mach 1.07	$755	Printing	Ten-Key	15	Fully automatic	Yes	Yes	No	52
MONROE INTERNATIONAL, INC.	PC 1421	$1,175	Rotary/Ptg.	Ten-Key	21	Fully automatic	Yes	Yes	Yes	52
OLIVETTI UNDERWOOD	Prima 20	$115	Printing	Ten-Key	11	Fully automatic	No	No	Yes	53
OLIVETTI UNDERWOOD	Quanta 20	$185	Printing	Ten-Key	11	Fully automatic	No	No	Yes	53
OLIVETTI UNDERWOOD	Electrosumma 20	$229	Printing	Ten-Key	11	Fully automatic	No	No	Yes	53
OLIVETTI UNDERWOOD	Electrosumma 22	$245	Printing	Ten-Key	13	Fully automatic	No	No	Yes	53
OLIVETTI UNDERWOOD	Multisumma 22	$285	Printing	Ten-Key	13	Fully automatic	No	No	Yes	53
OLIVETTI UNDERWOOD	Multisumma 24	$465	Printing	Ten-Key	13	Fully automatic	Yes	Yes	Yes	53
OLIVETTI UNDERWOOD	Multisumma 24 GT	$625	Printing	Ten-Key	13	Fully automatic	Yes	Yes	Yes	53
OLIVETTI UNDERWOOD	Divisumma 24	$625	Printing	Ten-Key	13	Fully automatic	Yes	Yes	Yes	53
OLIVETTI UNDERWOOD	Divisumma 24 GT	$725	Printing	Ten-Key	13	Fully automatic	Yes	Yes	Yes	53
OLIVETTI UNDERWOOD	Tetractys	$875	Printing	Ten-Key	13	Fully automatic	Yes	Yes	Yes	53
OLIVETTI UNDERWOOD	Electrosumma 24	$385	Printing	Ten-Key	13	Fully automatic	No	Yes	Yes	53
REMINGTON OFFICE MACHINES	DX 94	$399.50	Printing	Ten-Key	10	Semi-automatic	No	No	No	54
REMINGTON OFFICE MACHINES	DX 99	$475	Printing	Ten-Key	12	Fully automatic	No	No	No	54
REMINGTON OFFICE MACHINES	DM 99-120	$599.50	Printing	Ten-Key	12	Fully automatic	Yes	No	Yes	54
REMINGTON OFFICE MACHINES	DM 99-140	$675	Printing	Ten-Key	14	Fully automatic	Yes	No	Yes	54
VICTOR COMPTOMETER CORP.	Premier 79-88-54	$635	Printing	Ten-Key	14	Fully automatic	No	Yes	Yes	55
VICTOR COMPTOMETER CORP.	Premier 77-88-54	$560	Printing	Ten-Key	14	Fully automatic	No	No	Yes	55
VICTOR COMPTOMETER CORP.	Custom 75-88-54	$570	Printing	Ten-Key	11	Fully automatic	No	Yes	Yes	55
VICTOR COMPTOMETER CORP.	Custom 73-85-54	$495	Printing	Ten-Key	11	Fully automatic	No	No	Yes	55
VICTOR COMPTOMETER CORP.	Custom 72-85-54	$395	Printing	Ten-Key	11	Fully automatic	No	No	Yes	55
VICTOR COMPTOMETER CORP.	Comptograph 12ML	$445	Printing	Ten-Key	12	Fully automatic	Yes	Yes	Yes	55
VICTOR COMPTOMETER CORP.	Comptometer 12D	$940	Keydrive	Full Keyboard	13	Semi-automatic	Yes	Yes	Yes	55
VICTOR COMPTOMETER CORP.	Comptometer 9D	$820	Keydrive	Full Keyboard	10	Semi-automatic	Yes	Yes	Yes	55
VICTOR COMPTOMETER CORP.	Comptometer 12E	$685	Keydrive	Full Keyboard	13	Semi-automatic	No	Yes	Yes	55
VICTOR COMPTOMETER CORP.	Comptometer 9E	$580	Keydrive	Full Keyboard	10	Semi-automatic	No	Yes	Yes	55
VICTOR COMPTOMETER CORP.	Comptometer 12B	$500	Keydrive	Full Keyboard	13	Semi-automatic	No	Yes	Yes	55
VICTOR COMPTOMETER CORP.	Comptometer 9B	$445	Keydrive	Full Keyboard	10	Semi-automatic	No	Yes	Yes	55
VICTOR COMPTOMETER CORP.	Comptometer 6B	$275	Keydrive	Full Keyboard	7	Semi-automatic	No	Yes	Yes	55
WYLE LABS	Wyle Scientific	$3,950	Electronic	Ten Key	24	Fully automatic	Yes	Yes	Yes	56

especially when dealing with very large numbers.

Who is right? About three-quarters of all calculators sold are now ten-key models. The main users of the full keyboard models sold today are banks, and the great majority of calculators sold to general offices are of the ten-key variety. Each type seems to have a definite use.

PRINTING

PRINTING CALCULATORS differ from one another in capacity, speed, keyboard layout, and in optional features provided.

Many machines have a capacity of ten columns. This means that a ten-digit number, such as 28,699,123.58, is the largest that can be entered into the key-board. A machine that lists ten digits and totals eleven can deliver an answer of eleven digits. Sometimes the capacity of a calculator is given in three numbers, such as 11/10/21. This means that an eleven-digit number can be multiplied by a ten-digit number, and that a 21-digit answer is possible.

Except for the arrangement of the nine digit keys on the ten-key keyboard, a standard keyboard for figuring machines does not exist. No two machines of different makes have the same layout of control keys (total, subtotal, plus, etc.). For a machine which may be used only occasionally by different people in an office, clear marking of the keys is more important than the layout, though a crowded keyboard, with poorly grouped control keys, can encourage errors.

Almost any operator who uses the machine frequently will quickly become accustomed to the keyboard, and other considerations, such as the presence of particular features not found on all machines, become more important than layout.

While some skilled operators may prefer machines which can be operated with a light touch, for most, key pressure is of relatively minor importance.

Calculators and adding machines should be bought with a specific purpose, a specific work station, in mind. Some features will make one machine ideal for a certain use, while the same machine will be inadequate for another office use.

Some of the features to put on

Today's office practically rolls on the round gears of the adding machine and the calculator, from the time the orders come in and are checked and totaled by a machine operator, to the time monthly sales are totaled.

Figuring CONTINUED

your checklist while shopping for a printing calculator are the following:

Credit balance. A machine equipped with this feature automatically indicates a negative value when a larger number is subtracted from a smaller one. Obviously, the most common application is for determining the status of accounts. Many figuring machines are used for this kind of work. For that reason, this feature has become practically a standard feature, available from most of the major makers. Not only two numbers, but a whole column of numbers can be assigned positive and negative values.

Column indicator. Most machines have this feature, which tells the operator how many digits she has indexed. The operator using a full keyboard can check the column she is in —tens, hundreds, thousands, etc. —by merely looking at her keys and seeing how many she has depressed. The ten-key operator can't do this, so the manufacturers have provided the column indicator to avoid confusion.

One model has a check window that shows not only the number of digits indexed, but the actual digits themselves. Before enter-

ing the number into the machine, the operator sees the actual number in the window.

Storage facilities. This relatively new feature makes payroll, inventory, and other calculations where one constant factor is multiplied over again by many changing factors go more quickly. A memory feature enables the operator to enter a constant factor that will be used over again into her machine. She can bring it out of memory as often as she wishes by merely pressing the proper control key. Usually, a number stays in memory until it is replaced by another. Only a few makers have a true memory feature.

TRANSFER

BACK TRANSFER. This useful feature enables the operator to easily accomplish multiplication involving more than two factors. Back transfer utilizes the memory register to temporarily store the product of the first two numbers of the problem. It is then multiplied by the next number. The operator, using the back transfer key, can then store this product in memory and multiply it by a subsequent number. This process is continued until the entire problem is completed.

Decimal point identification.

Dealing with decimal points has always been somewhat of a problem. Many machines are equipped with some sort of mechanical device that identifies the proper position for the decimal point in addition and subtraction. Only a few models actually calculate the position of the decimal point internally and print it out. Most models merely print a decimal point between the second and third number from the right, as many machines are used to calculate dollars and cents.

Double register. Double register machines are actually two calculators in one. The user can enter a number in both registers in one operation. This feature is especially useful in mathematical, scientific and statistical applications, or any situation where the same numbers are used at once in different combinations or values. Double register machines are necessarily more expensive than standard single register machines.

Correction and back-space keys. Most machines have some type of correction feature. A few have manual correction levers.

Most have electrified keys for correcting wrong numbers before they are entered into the machine. If a wrong digit is depressed, the entire number is

Most people in offices use a figuring machine at one time or another.

Engineers often have calculators at their work stations. Many engineering operations also have a full-time calculator operator to help the men.

erased by means of the correction key. Some machines have a back space key which erases only one digit at a time rather than the entire number.

Non-add key. This relatively new feature permits the operator to use the calculator to put such numbers on the tape as dates, invoice numbers, employee numbers, account numbers, etc. The feature is useful where the tape is filed for reference or is forwarded to another work station for further processing. Often, the only alternative to a non-add key is to write such numbers in on the tape with pen or pencil. With this in mind, many manufacturers provide for extra-wide tapes and design their machines so that the tape rides over a small "writing platform."

The operator using a machine equipped with a non-add key merely keys the number just as if she were going to enter it into the machine, using the digit keys. Then, instead of depressing one of the standard control keys, she presses the non-add key. Some offices feel that this feature is liable to be misused, and purposely avoid machines with a non-add feature.

Dater. This is related to the non-add feature. It also provides for the printing of a number without listing it. The number,

however, is considerably smaller than the numbers normally produced by the machine. There is no mistaking them for the regular machine numbers. This feature is only useful for printing the same number repetitively, such as a date. The number is first set manually by rotating tiny wheels in the head of the machine.

Interlocking. This built-in feature reduces errors resulting from the simultaneous depression of two keys. Some models have only interlocked control keys. Others have interlocking digit keys as well.

Tape spacing. Some machines offer a choice of single or double space printing, as desired. Double spacing is useful where written notes on the tape are required. Many models automatically double space only after totals or subtotals.

NON-PRINT

THERE are two basic types of figuring machines in common use, beside the printing calculator, which itself is considered a basic type. The two types of non-printing calculators are the rotary calculator and the key-driven machine.

Although at first glance they look similar, with their full bank keyboards, they are operated in

ways that are quite different. In a rotary machine, the complete number is first set up on the keyboard, checked, and then a motor bar or lever is depressed to record the number into the machine. In a key-driven machine, a number is added into the machine as soon as its key is depressed. Key driven machines, which are essentially extremely high speed adders, keep a running total of the problem as factors are entered into it.

Rotary calculators, typically, are full keyboard models that do not print. Some models are ten-key, however, and there are a few printing rotary calculators. Usually, rotary calculators show the results of calculations in rows of rotating number dials. The dials are shown in windows located in a carriage on top of the machine. They may be used to do ordinary addition and subtraction, but, like any true calculator, they are more efficiently used when directed to high speed multiplication and division problems for which they have been designed.

When it became possible to electrify rotary calculating machines the first consideration was the elimination of the manual operation of the crank handle. Today, the mere depression of a key ensures the equivalent rotations. To begin with,
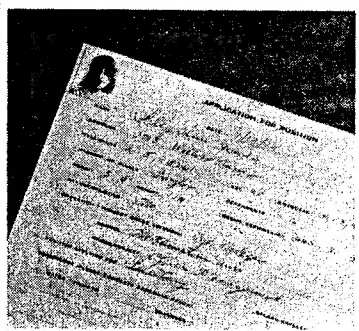
COMPUTERS

Next month, "Tools of the Office" will spotlight computers. Featured will be specifications of available hardware, as well as software.

SCM Corporation's model E-78 adding machine has true credit balance.
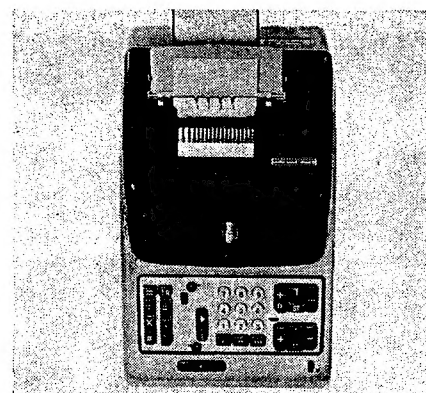
Olivetti Underwood Tetractys 24 calculator has many special uses.

Figuring CONTINUED

the multiplying operation was powered and then the division, but it is, from the engineer's point of view, easier to provide facilities for fully automatic division than for fully automatic multiplication. So when a machine is described as semi-automatic it usually means that division can be done automatically; multiplication, semi-automatically. There are however, some machines that provide fully automatic multiplication and semi-automatic division. This is apart, of course, from the fully automatic machines which perform both operations without further intervention from the operator.

ADVANTAGES

ALTHOUGH they do not record, non-printing rotary calculators offer, to a varying degree, advantages over most printing calculators, aside from the full keyboard. They are:

1. Greater flexibility in the handling of a series of interrelated operations without re-entry of intermediate results.

2. Greater column capacity for multiplication and division problems.

3. Greater speed, especially in division.

The advantages offered by rotaries are most obvious in the handling of complex interrelated problems, and in multiplication and division calculations involving large numbers.

The rotary calculator is highly dependent on the skill of the operator, however. Their ability to handle complex interrelated problems will be wasted if the operator does not use the machine sufficiently to become highly skilled. In such a calculation, after the digit keys have been depressed to enter a number in the keyboard, several different function keys and levers may have to be depressed or moved in a particular order before the next number is entered. An operator who has not fully mastered the machine will not only waste a great deal of time in performing the calculations, but she is almost certain to make errors.

Key driven calculators are never printing models, and are always of full keyboard design. The results, like results of most rotaries, are shown on visual number dials. The dials are seen through windows which are often located on the bottom of the machine. They are particularly suited to high-speed addition and subtraction because the operator can enter all the digits of the number to be processed at the same time. It therefore requires less time for the operator to instruct the machine. There are far fewer control keys on a key-driven calculator than on any other type. Operating keys on standard machines are limited to the clear key and possibly a set of cut-off keys. The key driven calculator is greatly dependent on operator skill. Given extended operations of a certain type, over a consid-
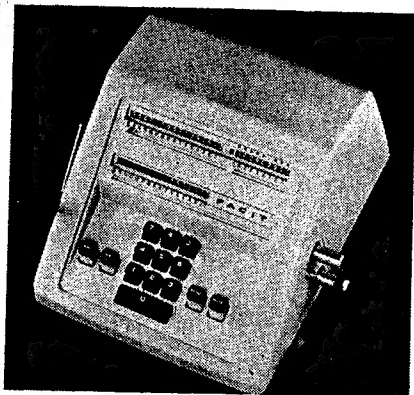
Facit CM2-16 is a manual calculator, has back transfer, is portable.
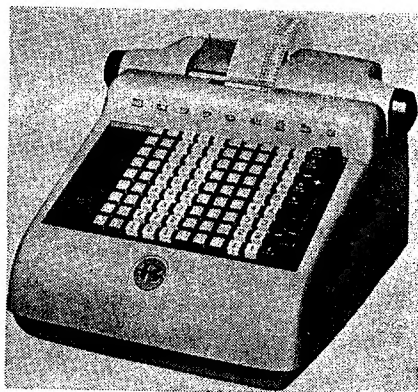
Burroughs Director 400 adding machine features two full registers.

erable length of time, substantial time savings thus are realized.

The instant the keys are depressed, the results show up on the dials. The machine keeps up with the operator, and there is no waiting for the machine to complete its cycle. Multiplication and division are performed by repeated addition and subtraction.

ELECTRONIC

ELECTRONIC calculators, which represent a third type of non-printing calculator, are as new as tomorrow. They have just arrived on the scene, and only a few models are available at present. Only one major American figuring machine maker has released an electronic calculator to date. There is at least one other smaller American maker of electronic calculators. The largest selling model, at present, is European-made.

The electronic calculator is, in effect, a miniature computer, effecting calculations electronically rather than mechanically. Electronic desk calculators perform computation operations by means of circuit blocks in which electronic components are taken up in so called counting circuits. Results are displayed with figure tubes or ring counters. There is no mechanical cycling, and the device's speed is literally that of the speed of light. It is also completely silent. Performance is better too, as there are no moving parts to wear out and cause inaccuracies.

There is no such thing, at the present time, as a printing electronic calculator. This is considered to be a major drawback. An eminent authority told *AM* that practically all the American "name" manufacturers are working on the development of their own electronic calculators. The single-minded goal of each is the printing electronic calculator. It would not be a difficult matter to add a standard printing mechanism to an existing electronic calculator to make a printing model. This type of printing—with a raised metal surface against an inked ribbon — would slow the calculator down to such an extent that it would lose much of the speed advantage that it now has. To be feasible, the printing of an electronic calculator would have to be almost instantaneous. The printing mechanism of the printing electronic calculator, when it is born, will be based on photography, the electrostatic process, or another process that is basically chemical.

The electronic calculator is expensive, and this poses a problem. Many calculators sold are not used by full-time operators. Rather, they are used casually, when needed. Because of the way in which they are used, speed is not of the essence. Only full-time use for complicated problems would justify the high cost of an electronic calculator. For that reason, manufacturers do not envision the electronic calculator replacing the other basic types in the forseeable future. ∎